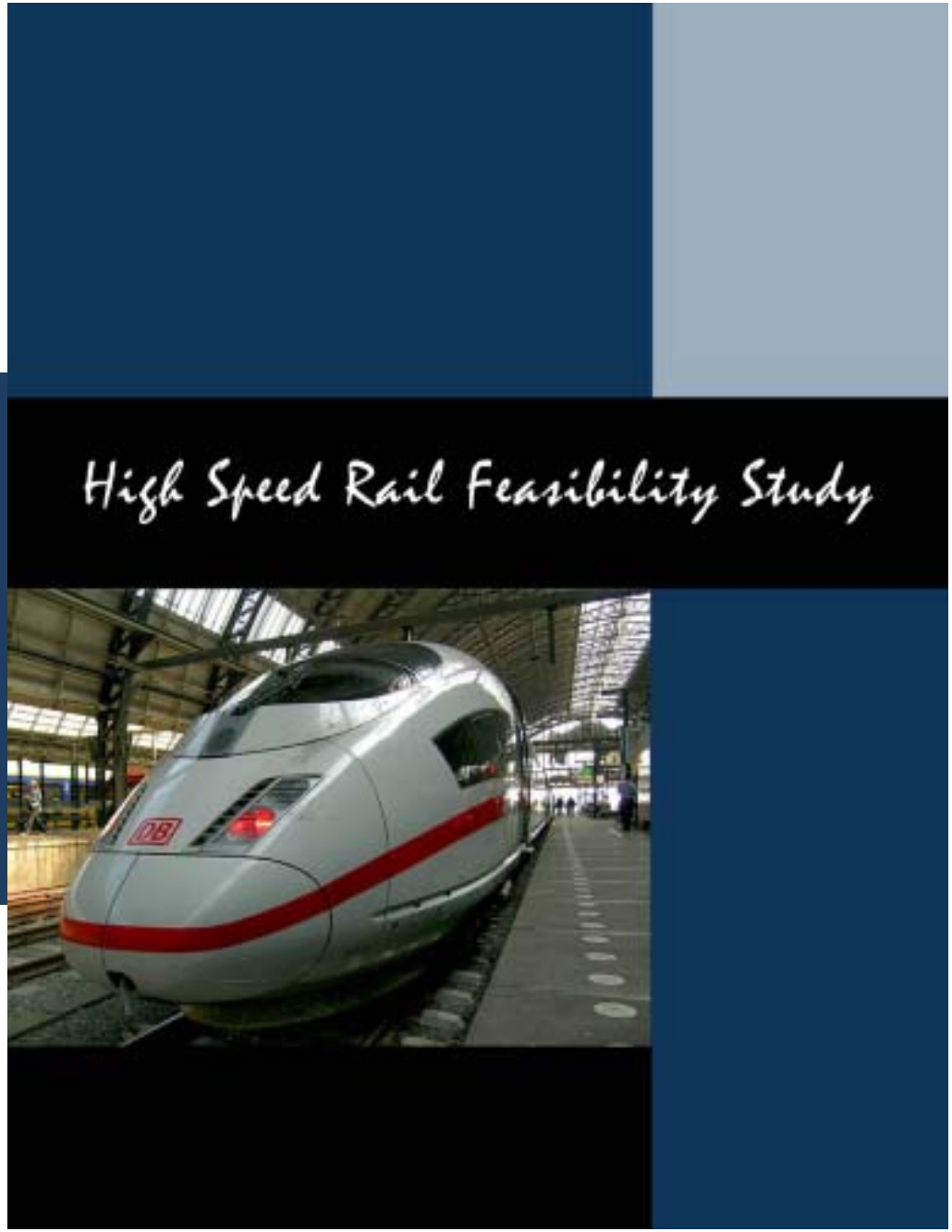
Presentation To

RMRA Feasibility Study Steering Committee

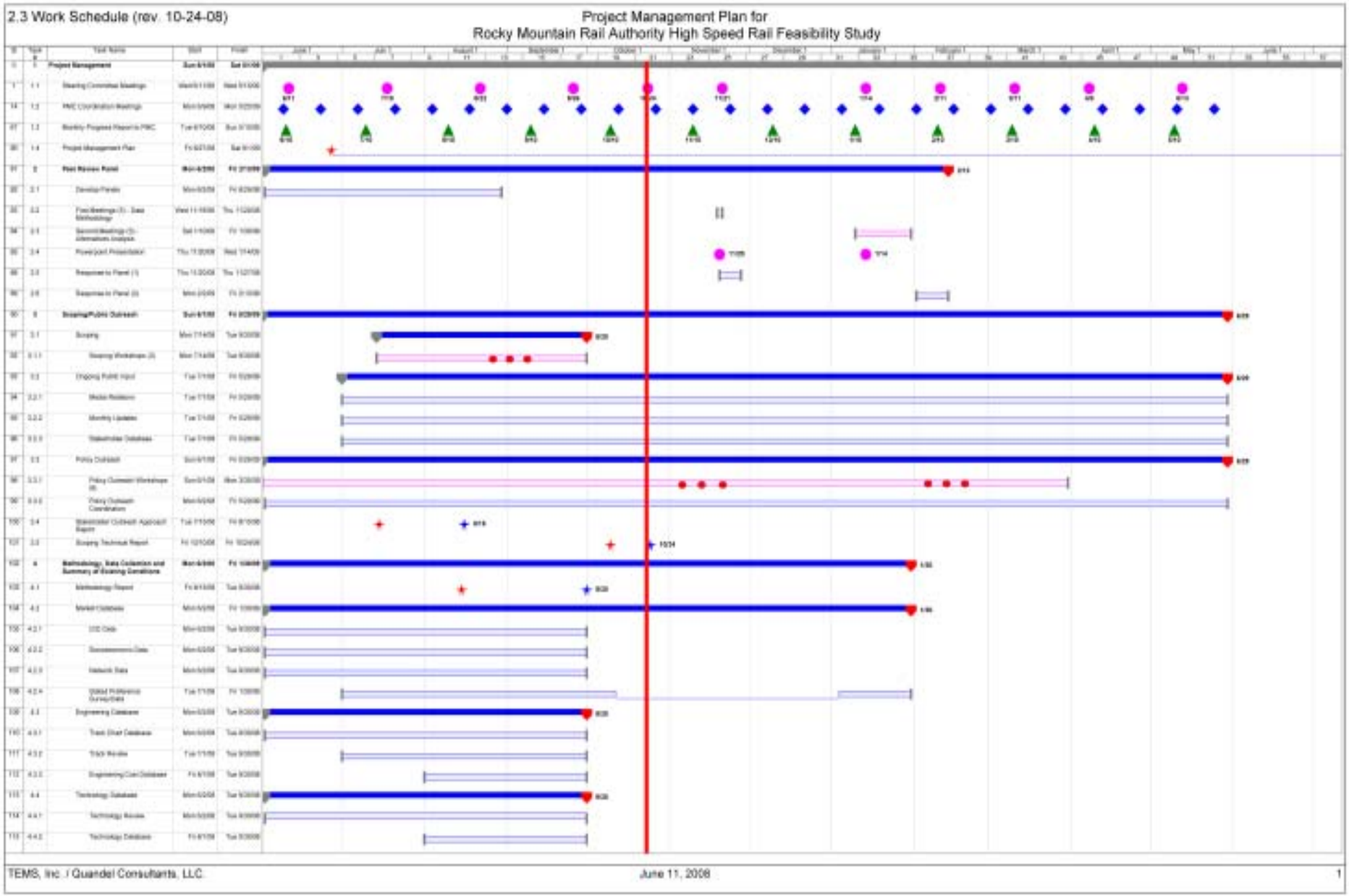
Feasibility Study Update

October 24, 2008

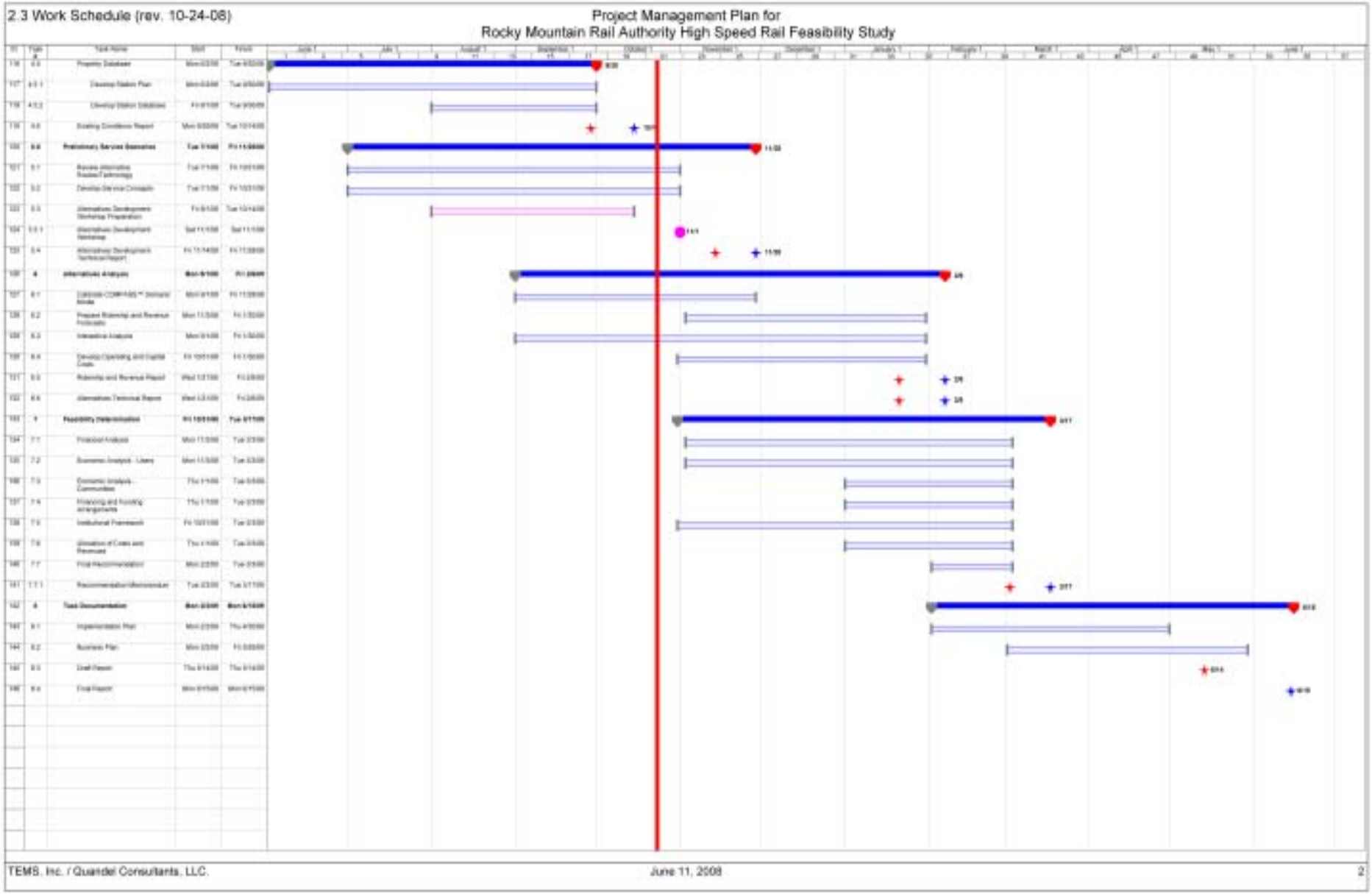


TEMS, Inc. / Quandel Consultants, LLC

Study Work Schedule: Tasks 1 thru 4.3.3



Study Work Schedule: Tasks 4.4 thru 8.4



Public Involvement Highlights

- Completed Scoping Report
- Community Partnership Program Outreach
- Enhanced Web Site

Scoping Report

- **Introduction**
- **Scoping Approach**
  - 43 entities participated in scoping meetings
  - 20+ entities submitted written comments
- **Scoping Findings**
  - General Findings
  - Denver Metro Findings
  - I-25 Corridor Findings
  - I-70 Corridor Findings
- **Participant List**
- **Raw Scoping Input**

Scoping Report: *General Findings*

- Support for study approach, particularly for technology categories vs. specific technologies
- Importance of continued coordination with current/previous studies
- Consult local planning to help inform station locations
- Speed/Travel time was one of highest priorities
- System interoperability was important

Scoping Report: *Denver Findings*

- Evaluate various technologies
- Identify potential local impacts & align with local plans
- Consider safety, noise and population density in potential alignments
- Consider power source for electric-powered technology

Scoping Report: *I-25 Findings*

- Existing ROW could save infrastructure costs
- Consider relationship between alignment options and ongoing projects (e.g. highway improvements)
- Concerns about safety and track-sharing
- Interest in the environmental/energy impacts of various technologies

Scoping Report: *I-70 Findings*

- **Ridership potential is a key re: speed and technology**
- **Recognition that topography limits alignment options**
- **Interest in local service/access and reducing corridor traffic**
- **Concerns with wildlife impacts generated interest in elevated system**

Community Partnership Program

- **Expanded list with support of RMRA members. Thank you!**
- **First outreach distributed on last week**
  - Introduction letter
  - Stock newsletter/web article
  - Study fact sheet
  - Study map
- **Coverage is expected to happen over next few weeks/months**
- **Some requests for presentations already coming in**

A Look Ahead…

November

- **Review/revise project materials based on 11/1 Alternatives Development Workshop**
- **Media outreach surrounding alternatives development**

December

- **Corridor Input Meetings (Alternatives Development)**
- **Outreach to Community Partnership Program**

Technology Issues

Maglev Review

- **LSM Motor (Guideway Based)**

German Transrapid

- Speeds of up to 300-mph proven in daily operation
- In operation at test track and Shanghai airport line
- Very expensive guideway
- It will be difficult to achieve the geometric standards required by this guideway on the I-70 corridor. It may be achievable on I-25.

- **LIM Motor (Vehicle Based)**

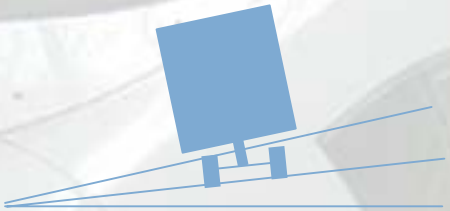
Japanese HSST

- This type of system was suggested by the 2004 Colorado Maglev study
- Speeds of up to 60-mph proven in daily operation – but speeds of 100-mph are unproven and require system enhancement
- LIM guideway more economical than LSM
- In operation at test track and Nagoya's Tobu Kyuryo line
- American Maglev has similar technology but no revenue implementation experience

Maglev Curving Capabilities

MAGLEV

TILT TRAIN



Banking Capabilities

- Maglev and Rail tilt train banking capabilities are both approximately 12º within FRA guidelines, practically equivalent to one another.
- Will lead to essentially the same speed restrictions through curves.
- Maglev and Rail tilt trains will both be faster (20-30%) than equivalent non-tilting trains.

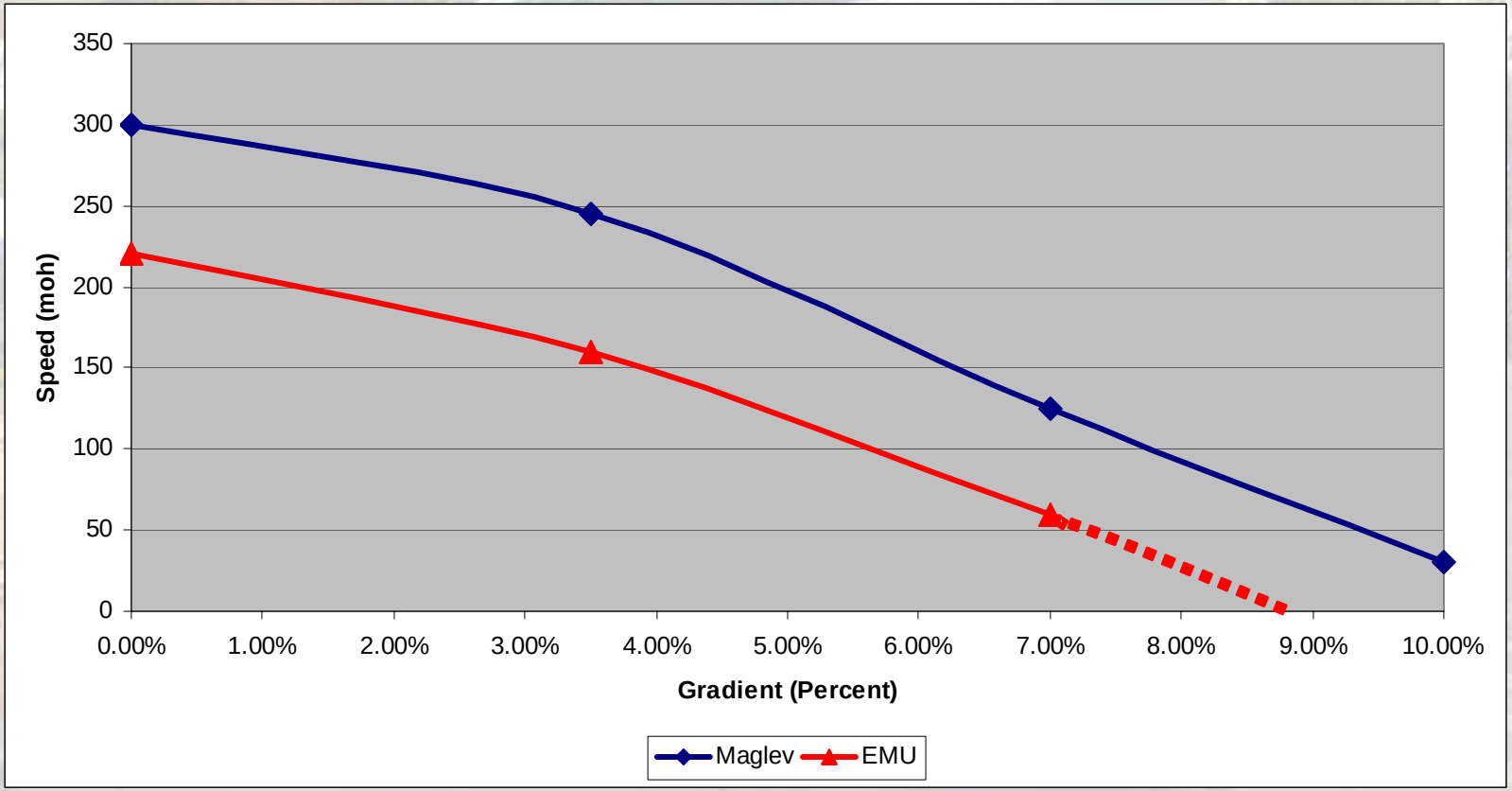
Calculation of Degrees Curvature

Degree	Radius
1	5,730 feet
2	2,865 feet
3	1,910 feet
4	1,433 feet
5	1,146 feet
6	955 feet

Maglev or Tilt Train Speed through Curves

		Passenger Reference Speeds (mph) with 6.0" Deficiency					
		Degree of Curve					
		1	2	3	4	5	6
Superelevation (in.)	0	93	65	53	46	41	38
	1	100	71	58	50	45	41
	1.5	104	73	60	52	46	42
	2	107	76	62	53	48	44
	3	113	80	65	57	51	46
	4	120	85	69	60	53	49
	5	125	89	72	63	56	51
	6	131	93	76	65	59	53

Rail and Maglev Gradient Capabilities



Source: http://www.crrel.usace.army.mil/techpub/CRREL_Reports/reports/maglev/Chap1+2(p1_16).pdf

- **Maglev is going up 7% grade at 125-mph**
- **EMU is going up a 7% grade at 60-mph**

Market Analysis: Survey Results

Survey Background

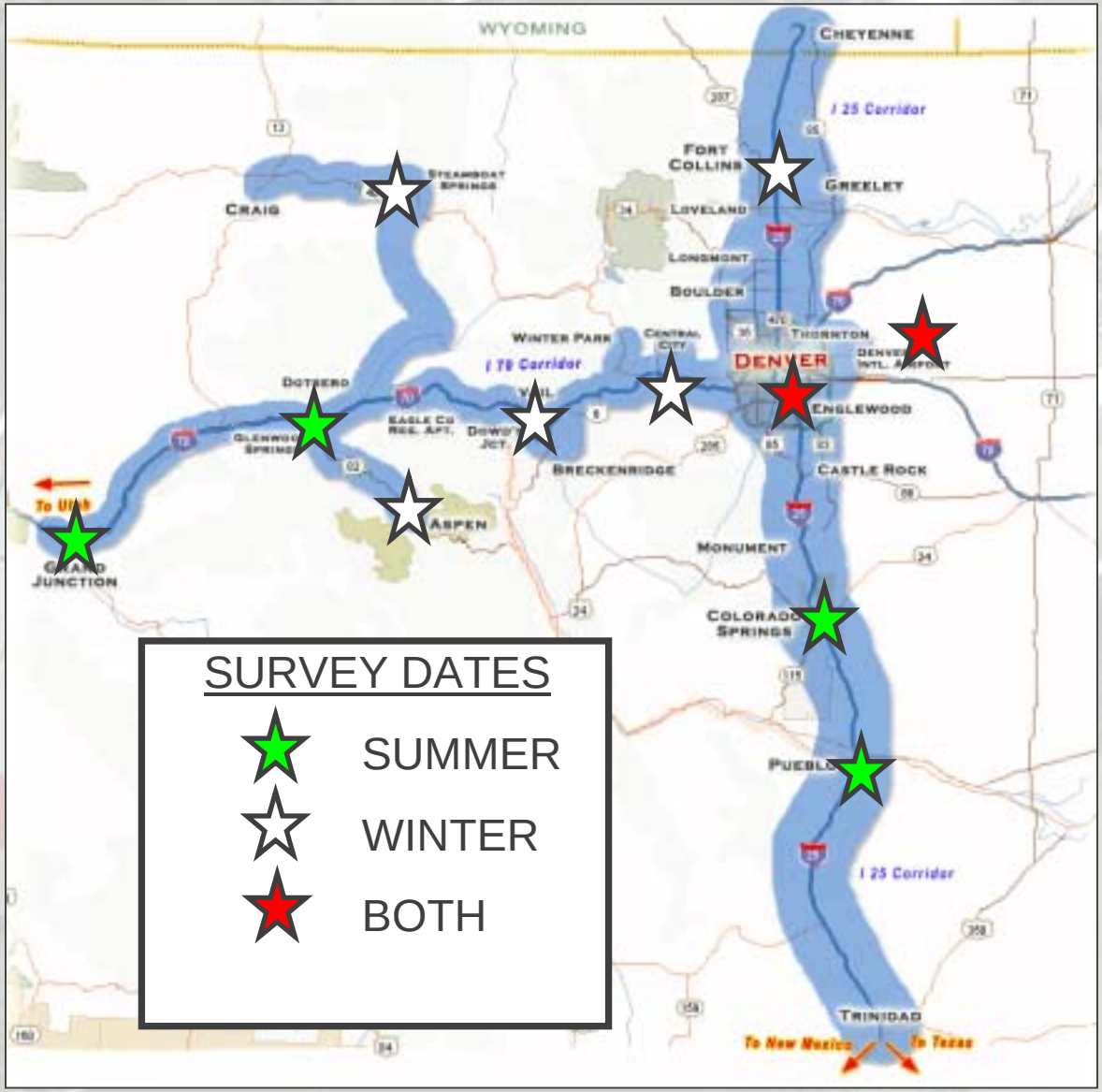
- **Goals**
  - Quantify how much travelers value time and frequency.
  - Discriminate behavior by mode and purpose of travel.
  - Evaluate O/D flows.
- **Approach**
  - Quota Surveys with individual "Sample Frame" Targets by Sub-Group (e.g. Trip Length, Mode, Trip Purpose).
- **Survey Implementation**
  - Pilots "test the waters" before full deployment of the Survey Team.
  - Fall Survey (completed) was targeted Primarily at Colorado Resident and non-seasonal tourism.
  - Winter Survey (future) will primarily focus on the Resort tourism and employee trip-making, but it will also provide a 2nd opportunity to adjust Resident survey counts as needed to fulfill specific "Sample Frame" Targets.

Proposed Survey Objectives

Location	Fall	Winter
Denver Int'l Airport	✖	✖
Buses (RTD/FREX/Greyhound)	✖	
Resorts*		✖
Amtrak	✖	
Ski Train		✖
DMV	✖	

* Resorts dropped from the Fall Survey due to low activity.

Survey Locations and Dates



Pilot Results*

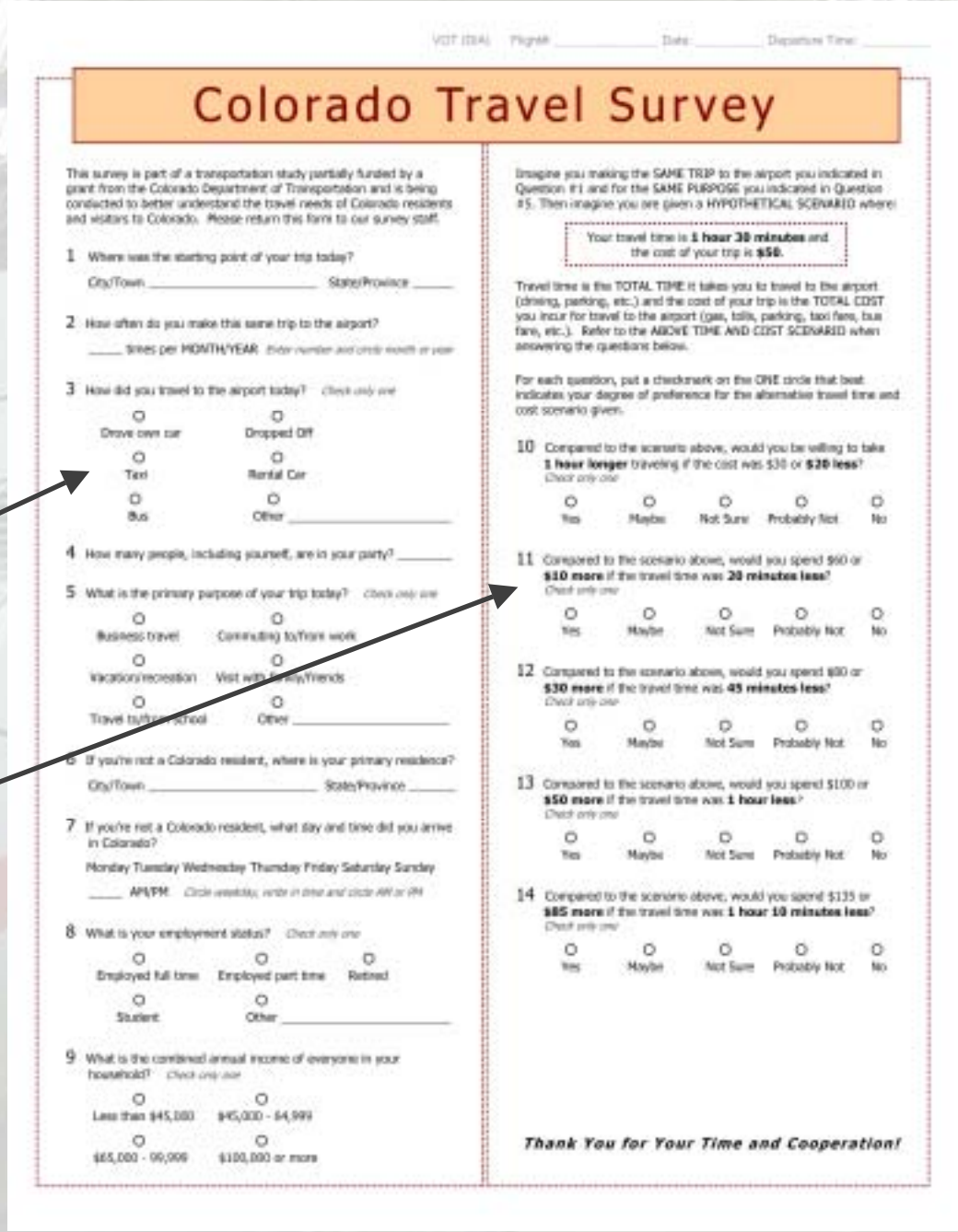
- **Basic survey design was validated.**
  - Stated preference questions were scaled so that respondents did "trade" within the ranges provided by the survey forms.
  - Minor adjustments to wording of questions and format were made to improve the readability of the forms.
  - The surveys were kept to one-page, one-side only.
- **Direct interview approach.**
  - All interviewees screened to see if they have enough time to complete the survey.
  - At DIA airport, connecting flights were screened out.
  - Most interviewees filled out the form themselves in 2-3 minutes.
- **Additional survey locations were added to the original plan.**
  - Pueblo and Grand Junction DMV's.
  - FREX bus surveys were shifted to Colorado Springs, Monument and Castle Rock.
  - Greyhound at Denver.
  - Amtrak at Grand Junction.

*** Pilots were conducted September 26 through October 1, 2008**

Example DIA Survey Questionnaire

Classification Questions on Left

Value of Time (VOT) Questions on Right*



VOT (DIA) Flight# _____ Date _____ Departure Time _____

Colorado Travel Survey

This survey is part of a transportation study partially funded by a grant from the Colorado Department of Transportation and is being conducted to better understand the travel needs of Colorado residents and visitors to Colorado. Please return this form to our survey staff.

1 Where was the starting point of your trip today?
City/Town _____ State/Province _____

2 How often do you make this same trip to the airport?
_____ times per MONTH/YEAR *Enter number and circle month or year*

3 How did you travel to the airport today? *Check only one*
○ Drove own car ○ Dropped Off
○ Taxi ○ Rental Car
○ Bus ○ Other _____

4 How many people, including yourself, are in your party? _____

5 What is the primary purpose of your trip today? *Check only one*
○ Business travel ○ Commuting to/from work
○ Vacation/recreation ○ Visit with Family/Friends
○ Travel to/from school ○ Other _____

6 If you're not a Colorado resident, where is your primary residence?
City/Town _____ State/Province _____

7 If you're not a Colorado resident, what day and time did you arrive in Colorado?
Monday Tuesday Wednesday Thursday Friday Saturday Sunday
_____ AM/PM *Circle weekday, write in time and circle AM or PM*

8 What is your employment status? *Check only one*
○ Employed full time ○ Employed part time ○ Retired
○ Student ○ Other _____

9 What is the combined annual income of everyone in your household? *Check only one*
○ Less than $45,000 ○ $45,000 - $4,999
○ $65,000 - 99,999 ○ $100,000 or more

Imagine you making the SAME TRIP to the airport you indicated in Question #1 and for the SAME PURPOSE you indicated in Question #5. Then imagine you are given a HYPOTHETICAL SCENARIO where:

Your travel time is **1 hour 30 minutes** and the cost of your trip is **$50**.

Travel time is the TOTAL TIME it takes you to travel to the airport (driving, parking, etc.) and the cost of your trip is the TOTAL COST you incur for travel to the airport (gas, tolls, parking, taxi fare, bus fare, etc.). Refer to the ABOVE TIME AND COST SCENARIO when answering the questions below.

For each question, put a checkmark on the ONE circle that best indicates your degree of preference for the alternative travel time and cost scenario given.

10 Compared to the scenario above, would you be willing to take **1 hour longer** traveling if the cost was $30 or **$20 less**?
Check only one
○ Yes ○ Maybe ○ Not Sure ○ Probably Not ○ No

11 Compared to the scenario above, would you spend $60 or **$10 more** if the travel time was **30 minutes less**?
Check only one
○ Yes ○ Maybe ○ Not Sure ○ Probably Not ○ No

12 Compared to the scenario above, would you spend $80 or **$30 more** if the travel time was **45 minutes less**?
Check only one
○ Yes ○ Maybe ○ Not Sure ○ Probably Not ○ No

13 Compared to the scenario above, would you spend $100 or **$50 more** if the travel time was **1 hour less**?
Check only one
○ Yes ○ Maybe ○ Not Sure ○ Probably Not ○ No

14 Compared to the scenario above, would you spend $135 or **$85 more** if the travel time was **1 hour 10 minutes less**?
Check only one
○ Yes ○ Maybe ○ Not Sure ○ Probably Not ○ No

Thank You for Your Time and Cooperation!

***The Bus and Rail Surveys also include a Value of Frequency (VOF) Question**

VOT and VOF are needed to define Travel Utility Equation for the Networks

$$U_{ijp} = f(GCijp)$$

Where

GC_{ijp} = Generalized cost of travel between zones i and j for purpose p

$$GC_{ijmp} = TT_{ijm} + \frac{TC_{ijmp}}{VOT_{mp}} + \frac{VOF_{mp} \times OH}{VOT_{mp} \times F_{ijm}}$$

Where

TT_{ijm} + = Travel time between zones i and j for mode m (in-vehicle time + waiting time delay time + connect time + access/egress time + interchange penalty), with waiting, delay, connect and access/egress time multiplied by two to account for the additional disutility felt by travelers for these activities

TC_{ijmp} = Travel cost between zones i and j for mode m and purpose p (fare + access/egress cost for public modes, operating costs for auto)

VOT_{mp} = Value of Time for mode m and purpose p

VOF_{mp} = Value of Frequency for mode m and purpose p

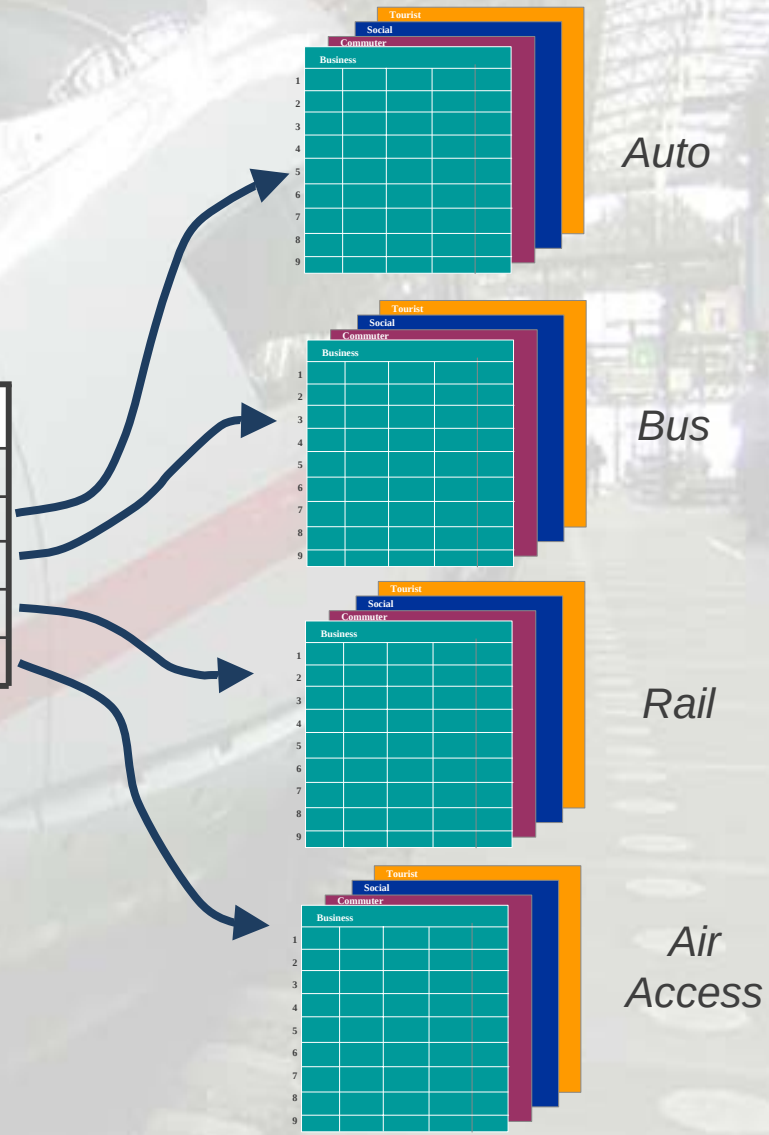
F_{ijm} = Frequency in departures per week between zones i and j for mode m

OH = Operating hours per week

Differential VOT Scaled to OD Matrices

VOT MATRIX

	Trip Purpose			
Mode	Business	Commuter	Social	Tourist
Auto	$x.xx	$x.xx	$x.xx	$x.xx
Bus	$x.xx	$x.xx	$x.xx	$x.xx
Rail	$x.xx	$x.xx	$x.xx	$x.xx
Air Access	$x.xx	$x.xx	$x.xx	$x.xx



Different VOT's are Applied to each Matrix depending on Mode and Trip Purpose

Total OD Travel Volumes are used to scale Quota Groups to the total population size

Fall Survey Actual Deployment

Fall Survey Team Actual Deployment

	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	2-Oct	3-Oct	4-Oct	5-Oct	6-Oct	7-Oct	8-Oct	9-Oct	10-Oct	11-Oct	12-Oct
DIA Airport Survey											
Colorado Springs DMV and FREX Bus											
Pueblo DMV											
Glenwood Springs DMV and Amtrak											
Grand Junction DMV and Amtrak											
Denver DMV, Greyhound, Amtrak and RTD Bus											
Denver Amtrak, Greyhound and RTD Bus											

Fall Survey Team Targets v. Actuals

Location	Survey Goal	Field Count
DIA Airport	1,000	1,105
Amtrak	200	220
RTD Regional Bus	250	209
FREX Bus	100	73
Greyhound Bus	0	99
DMV	1,000	1,102
TOTAL	**2,550**	**2,808**

Overall Bus Surveys:

350 Target v. 381 Actual

Stated Preference Sample Frame

Target Survey Goals by Sub-Market Category

	Business		Commuter		Social		Tourist	
	S	L	S	L	S	L	S	L
Rail	0	0	0	0	0	80	80	80
Air	0	80	0	80	0	80	0	80
Bus	0	80	80	80	80	80	0	80
Auto	80	80	80	80	80	80	80	80

S = Short Distance

L = Long Distance

Stated Preference Sample Frame and Results

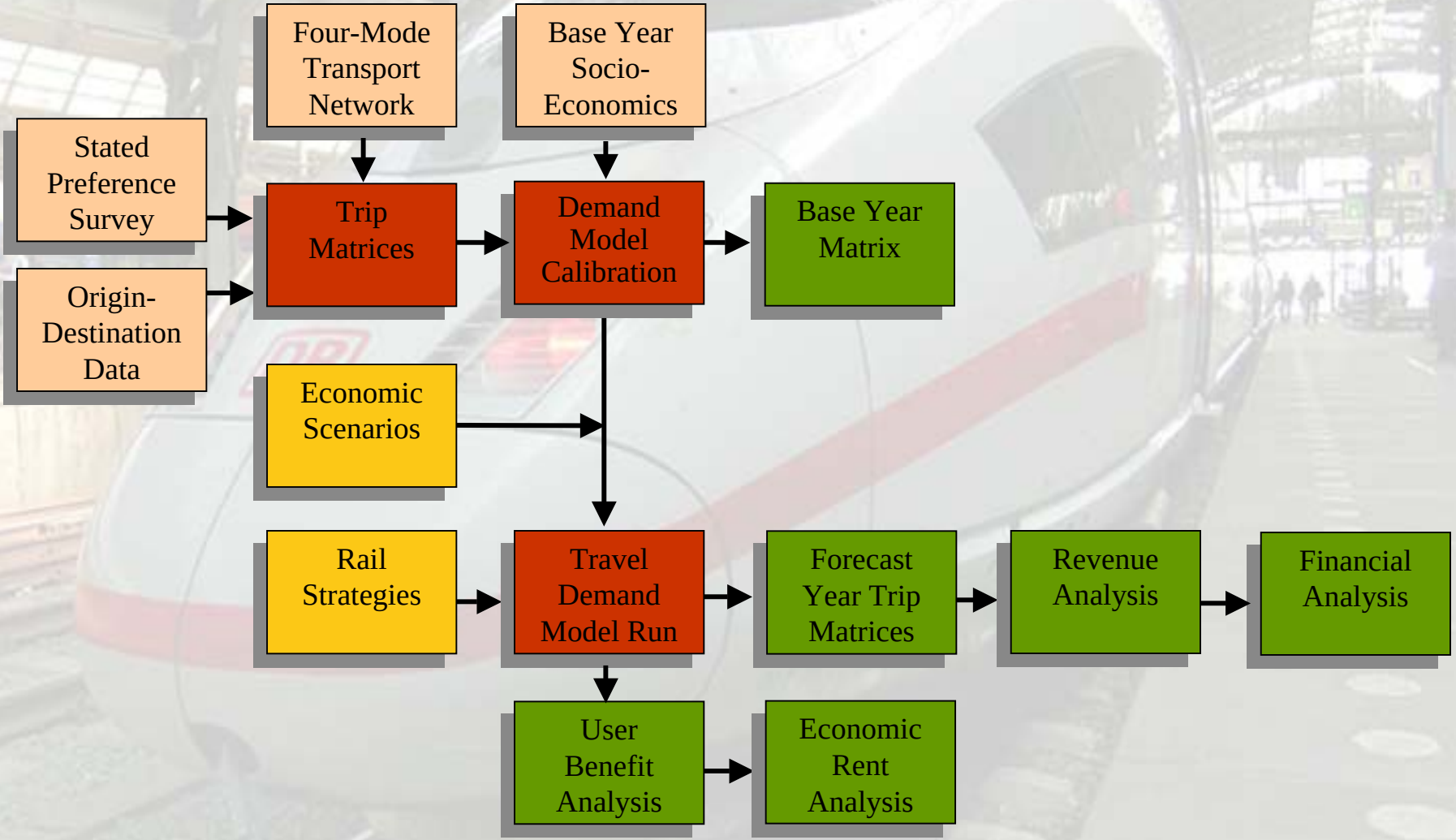
Target (Fall + Winter) / Actual Results (Fall Only)

	Business	Commuter	Social	Tourist
Rail	0 / 8	0 / 2	80 / 68	160 / 140
Air Access	80 / 336	80 / 13	80 / 395	80 / 358
Bus	80 / 45	160 / 172	160 / 117	80 / 44
Auto	160 / 236	160 / 163	80 / 456	160 / 235

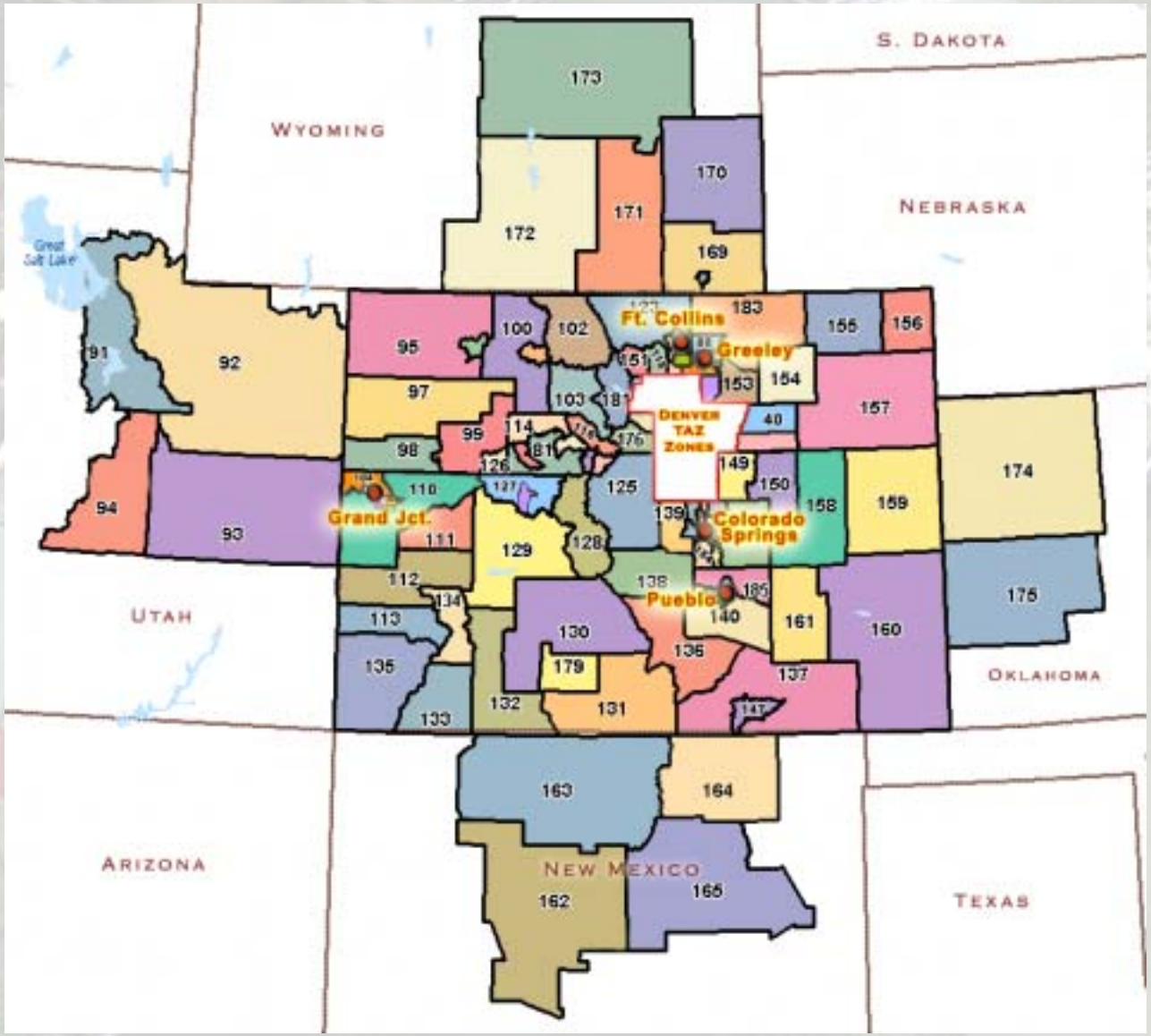
- The Winter survey deployment plan will be established as necessary to fulfill quotas for each sub-grouping
- Office Count Excludes Unusable Surveys

Market Analysis Data

COMPASS™ Model Structure



Zone System

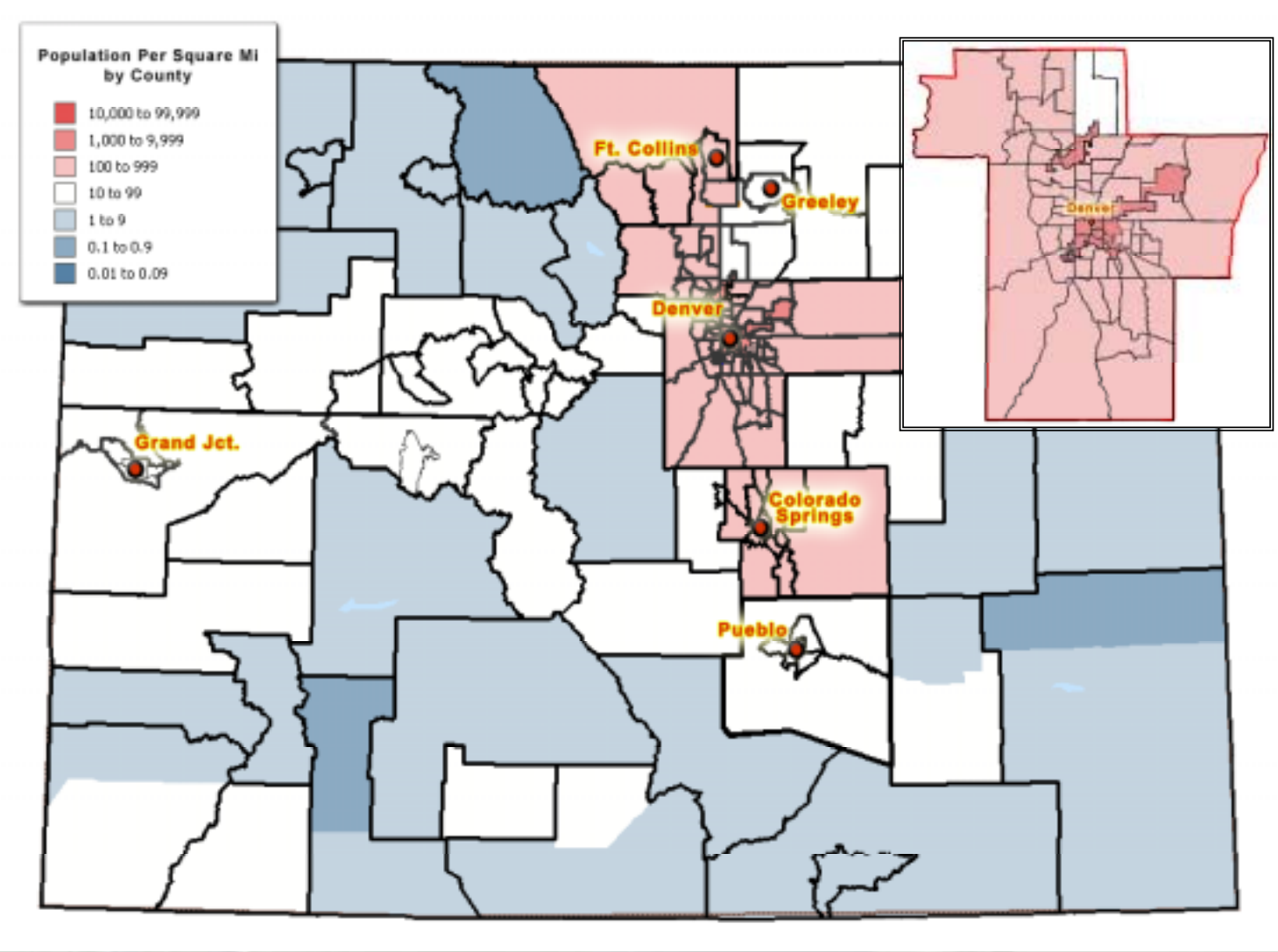


Socioeconomic Data for Colorado Metropolitan Statistical Areas (2006)

#	Name	Population	Per Capita Personal Income	Employment	Unemployment Rate
1	Denver PMSA	2,411,836	$44,691	1,638,281	4.4%
4	Colorado Springs MSA	602,496	$34,255	375,799	4.7%
2	Boulder-Longmont PMSA	288,125	$49,628	232,336	3.8%
5	Fort Collins-Loveland MSA	281,620	$35,397	190,105	4.0%
3	Greeley PMSA	235,366	$26,002	115,822	4.7%
6	Pueblo MSA	152,081	$26,363	75,490	5.7%
7	Grand Junction MSA	134,061	$30,746	83,742	4.0%

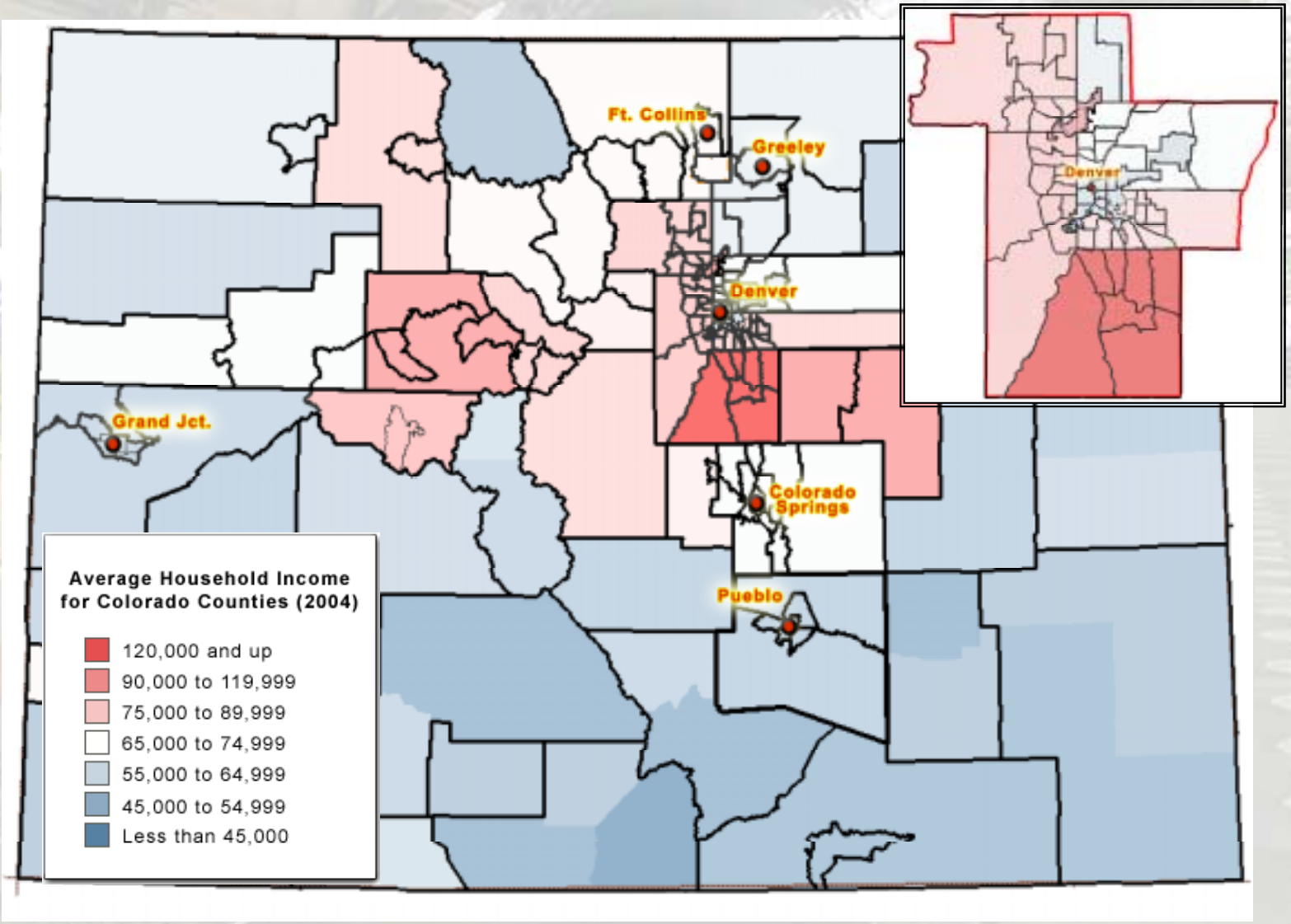
Source: Bureau of Economic Analysis, Regional Economic Accounts and Colorado Department of Labor and Employment

Colorado Population Density



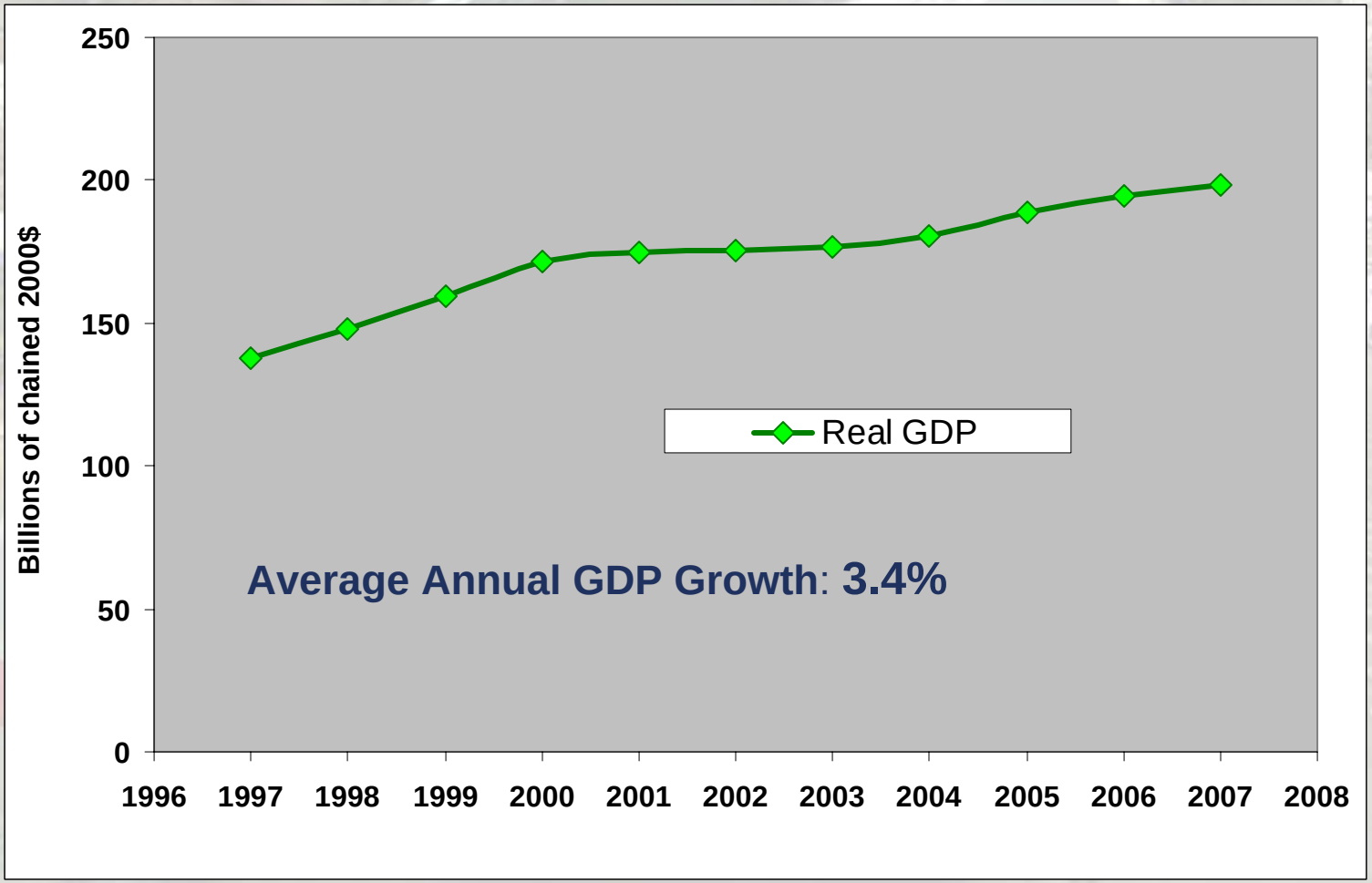
Source: Microsoft MS MapPoint 2006 demographic data provided by Applied Geographic Solutions.

Colorado Household Income



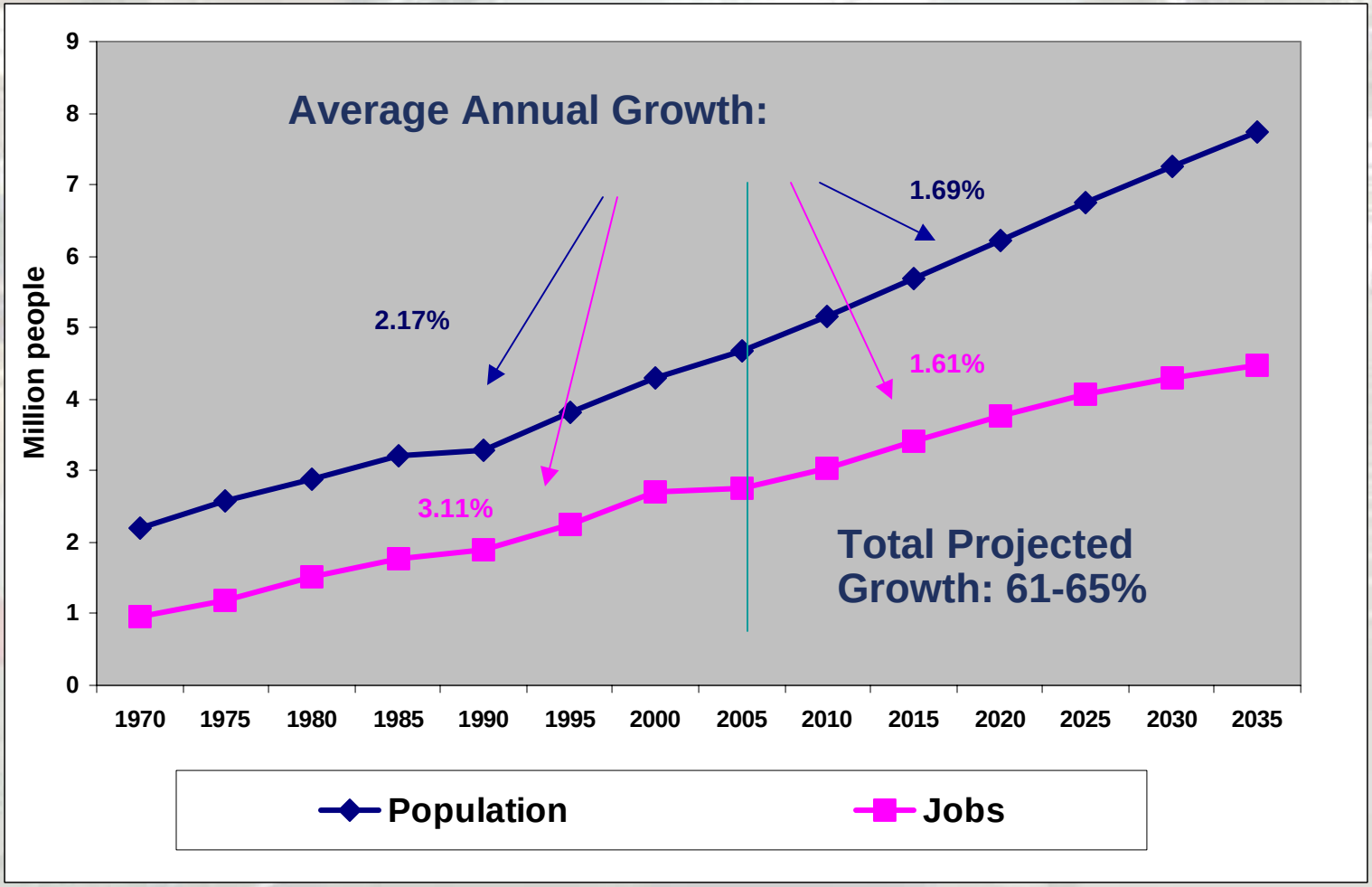
Source: Microsoft MS MapPoint 2006 demographic data provided by Applied Geographic Solutions.

State of Colorado Real GDP (1997-2007)

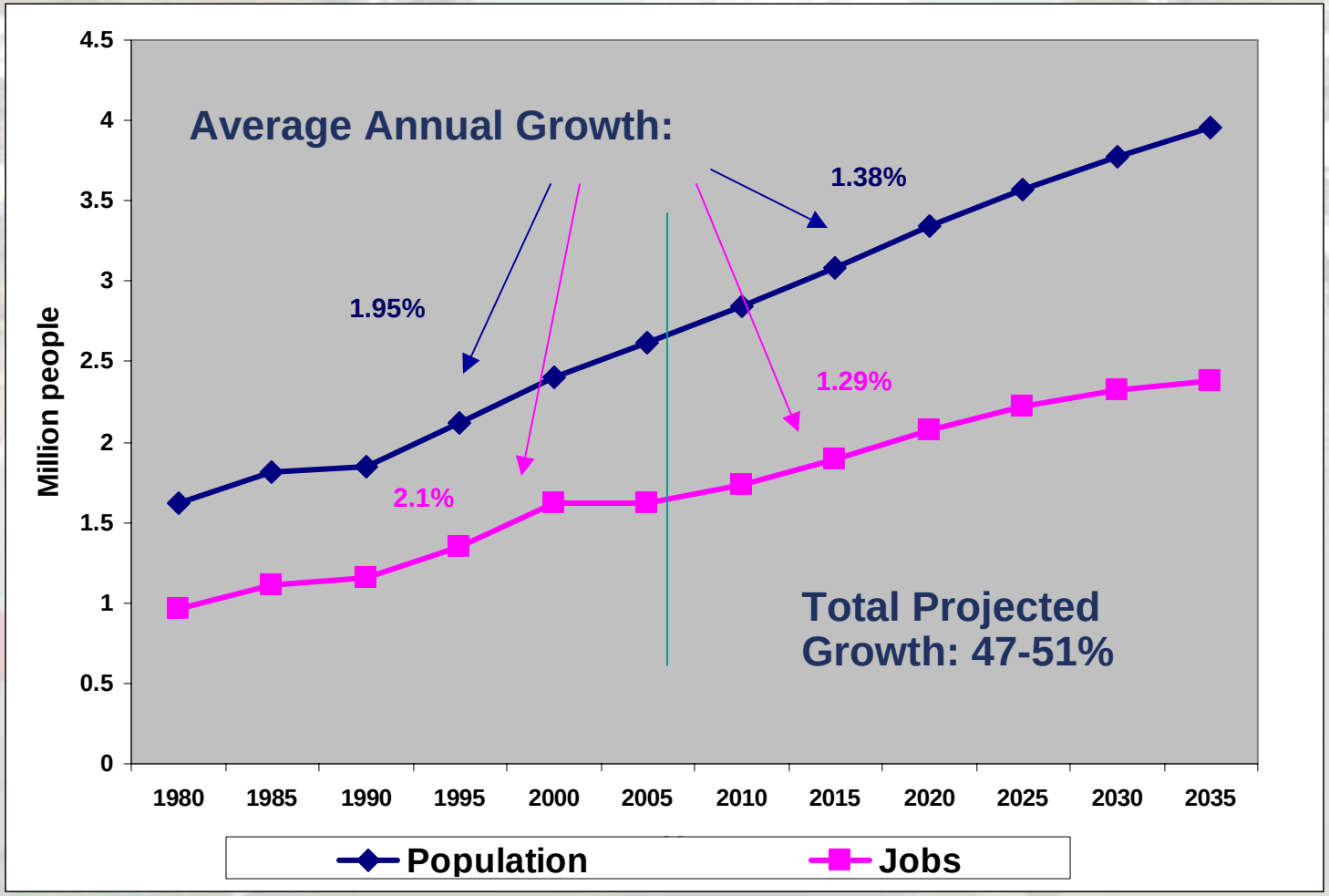


Socioeconomic Projections

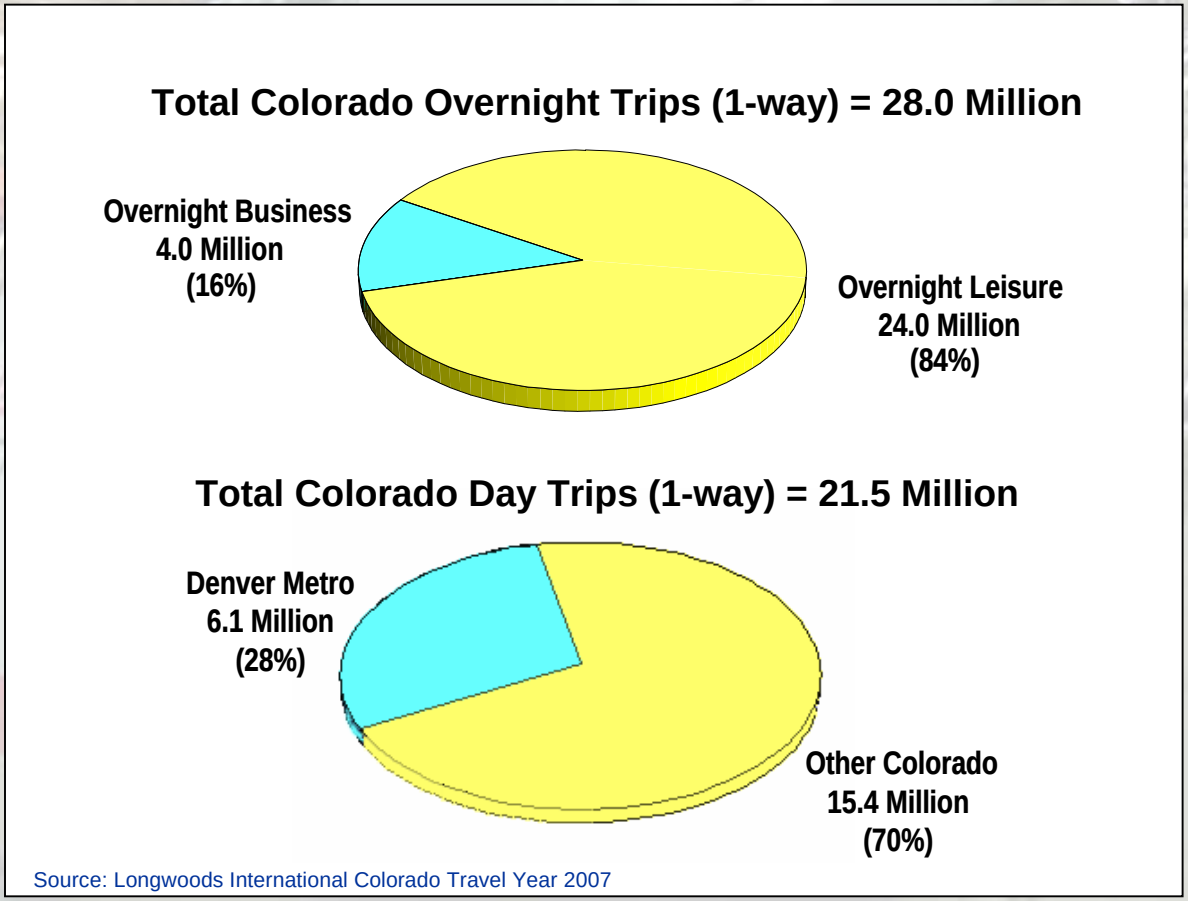
Population and Labor in the State of Colorado (1970-2035)



Population and Labor in the Denver Metro Area (1980-2035)



Overnight and Day Trips in Colorado 2007



Source: Longwoods International Colorado Travel Year 2007

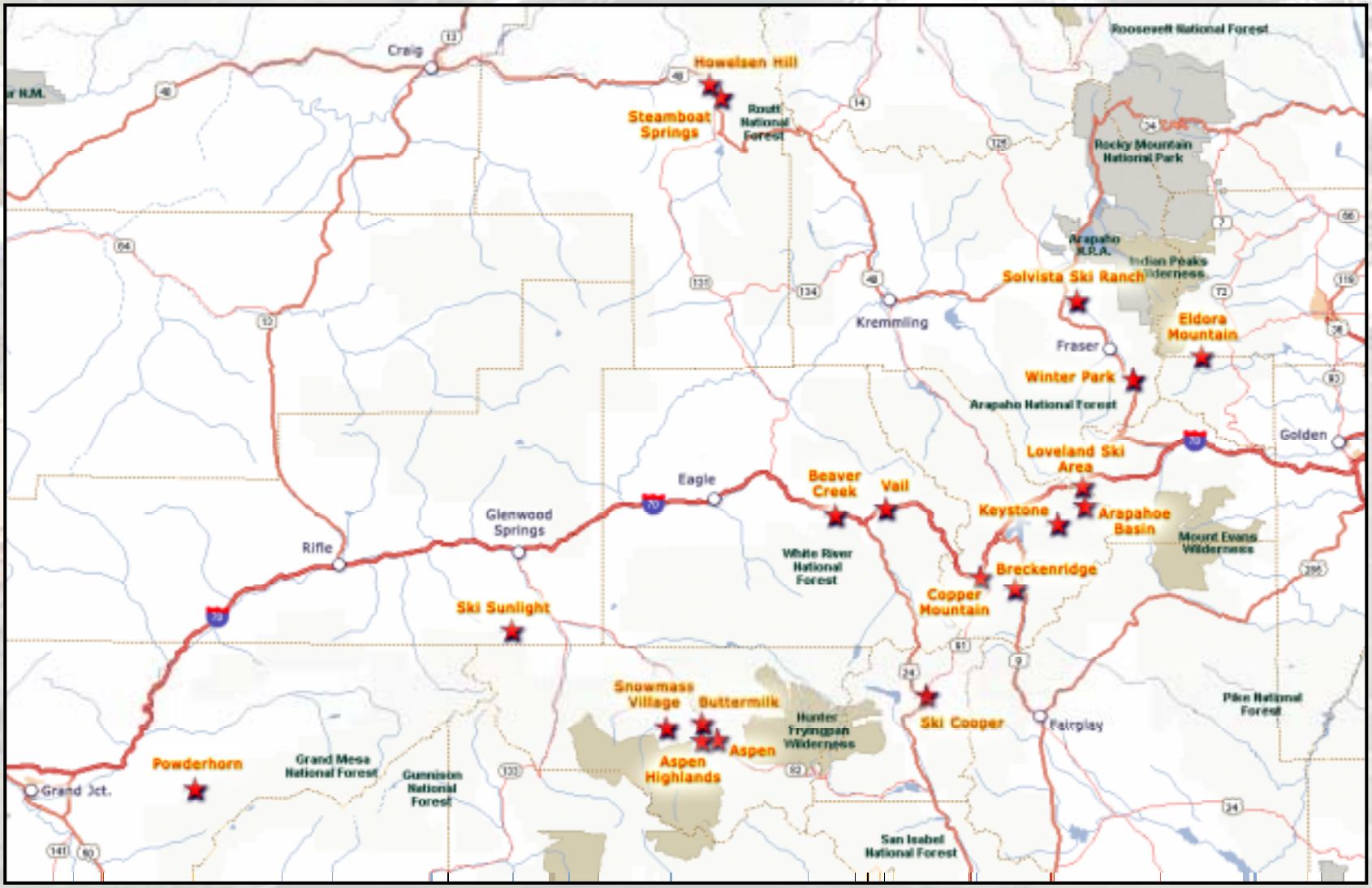
Colorado Skier Visits

colorado
SKI COUNTRY USA

	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08
Destination Resorts										
Aspen Highlands	142,090	127,389	140,640	136,136	157,317	160,836	167,390	193,242	193,648	211,635
Aspen Mountain	334,536	331,121	319,343	310,381	315,130	298,830	304,495	324,465	328,002	337,774
Buttermilk	178,089	158,194	148,826	145,683	141,077	139,213	148,012	159,081	153,957	154,926
Crested Butte	462,478	414,642	367,263	336,483	342,416	333,011	375,936	411,729	366,765	416,009
Cuchara	21,678	32,154	DNO	DNO	DNO	DNO	DNO	DNO	DNO	DNO
Durango	304,735	235,000	321,600	250,500	263,712	268,486	278,767	211,003	251,794	278,994
Howelsen Hill	14,475	14,000	14,000	15,208	14,000	14,009	16,526	18,423	17,054	20,128
Silverton Mountain	DNO	DNO	DNO	DNO	2,382	3,600	3,683	3,900	5,589	6,000
Snowmass	777,140	707,600	740,241	676,505	669,701	724,752	747,293	768,007	770,407	771,455
Steamboat	1,013,254	1,024,832	1,003,317	1,001,003	1,001,020	1,002,821	971,770	1,046,650	1,071,786	1,022,193
Telluride	382,467	309,737	334,506	341,370	367,252	367,775	411,396	390,348	426,244	450,730
Wolf Creek	202,053	114,802	187,116	170,847	183,907	210,857	215,821	197,052	222,979	195,583
Total Destination	3,832,995	3,469,471	3,576,852	3,384,116	3,457,914	3,524,190	3,641,089	3,723,898	3,808,225	3,865,427
Front Range Destination										
Beaver Creek	614,549	586,004	676,528	657,956	718,353	768,542	815,350	875,455	889,612	917,863
Breckenridge	1,385,927	1,444,365	1,422,783	1,468,518	1,424,770	1,402,055	1,470,961	1,619,043	1,650,321	1,630,106
Copper Mountain	867,394	803,312	992,888	1,005,913	1,058,016	931,143	1,046,242	1,132,021	1,046,959	934,870
Keystone	1,253,192	1,192,198	1,230,100	1,069,111	1,038,942	944,433	1,021,069	1,093,939	1,170,710	1,129,608
Vail	1,334,939	1,371,702	1,645,902	1,536,024	1,610,961	1,555,513	1,568,192	1,676,119	1,608,204	1,569,788
Winter Park	980,408	902,827	978,539	975,256	998,772	955,615	990,837	1,077,001	1,007,582	1,000,221
Total Front Range Destination	6,436,409	6,300,408	6,946,740	6,712,778	6,849,814	6,557,301	6,912,651	7,473,578	7,373,588	7,182,456
Gems/Front Range Resorts										
Arapahoe Basin	267,406	220,945	240,406	151,678	317,401	275,428	328,892	326,428	360,247	430,897
Berthoud	20,101	16,870	20,160	DNO	DNO	DNO	DNO	DNO	DNO	DNO
Echo Mountain	DNO	DNO	DNO	DNO	DNO	DNO	DNO	3,238	18,758	23,073
Eldora	175,939	229,785	233,741	250,000	286,528	278,454	281,242	305,030	308,794	286,017
Loveland	230,333	225,896	209,757	199,781	244,621	203,916	240,961	245,610	263,163	280,683
Monarch	140,000	127,215	147,266	138,850	147,094	144,984	142,190	166,451	160,941	175,173
Powderhorn	55,613	71,941	70,118	76,456	79,624	82,948	81,893	79,103	70,714	83,014
Ski Cooper	62,145	60,171	66,225	68,893	64,499	58,408	57,389	64,751	56,669	61,394
SolVista	90,330	92,514	71,303	62,837	65,900	58,482	57,886	64,882	71,633	74,459
Sunlight	78,290	77,047	84,104	82,742	92,382	66,650	72,004	80,139	73,567	78,010
Total Gems/Front Range Destination	1,120,157	1,122,384	1,143,080	1,031,237	1,298,049	1,169,270	1,262,457	1,335,632	1,384,486	1,492,720
Total:	11,389,561	10,892,263	11,666,672	11,128,131	11,605,777	11,250,761	11,816,197	12,533,108	12,566,299	12,540,603
# Increase/Decrease	(590,158)	(497,298)	774,409	(538,541)	477,646	(355,016)	565,436	716,911	33,191	(25,696)
% Increase/Decrease	-4.93%	-4.37%	7.11%	-4.62%	4.29%	-3.06%	5.03%	6.07%	0.26%	-0.20%

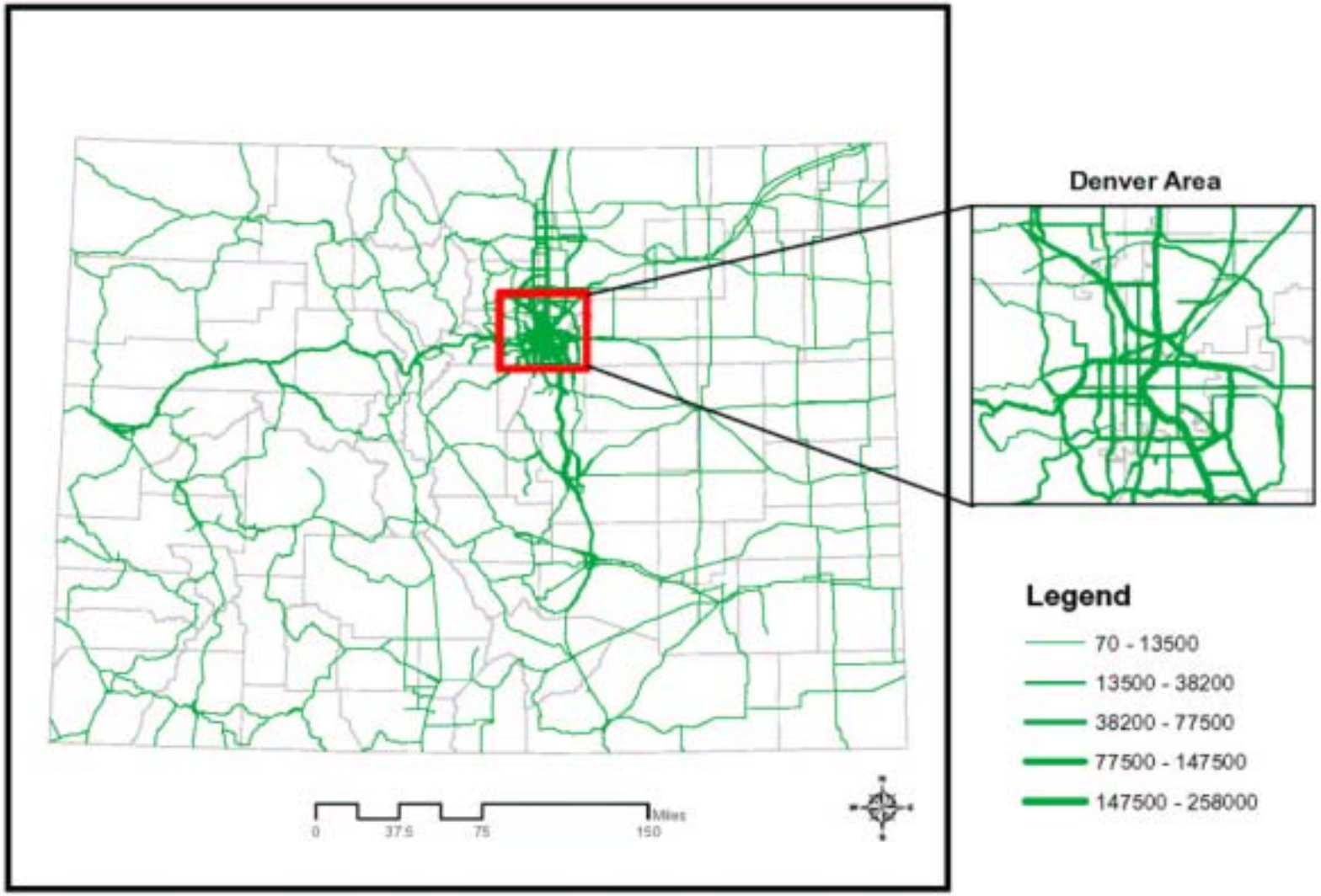
Source: Colorado Ski Country USA, http://media-coloradoski.com/cscfacts/skiervisits/

Colorado Ski Resorts along the I-70 Corridor



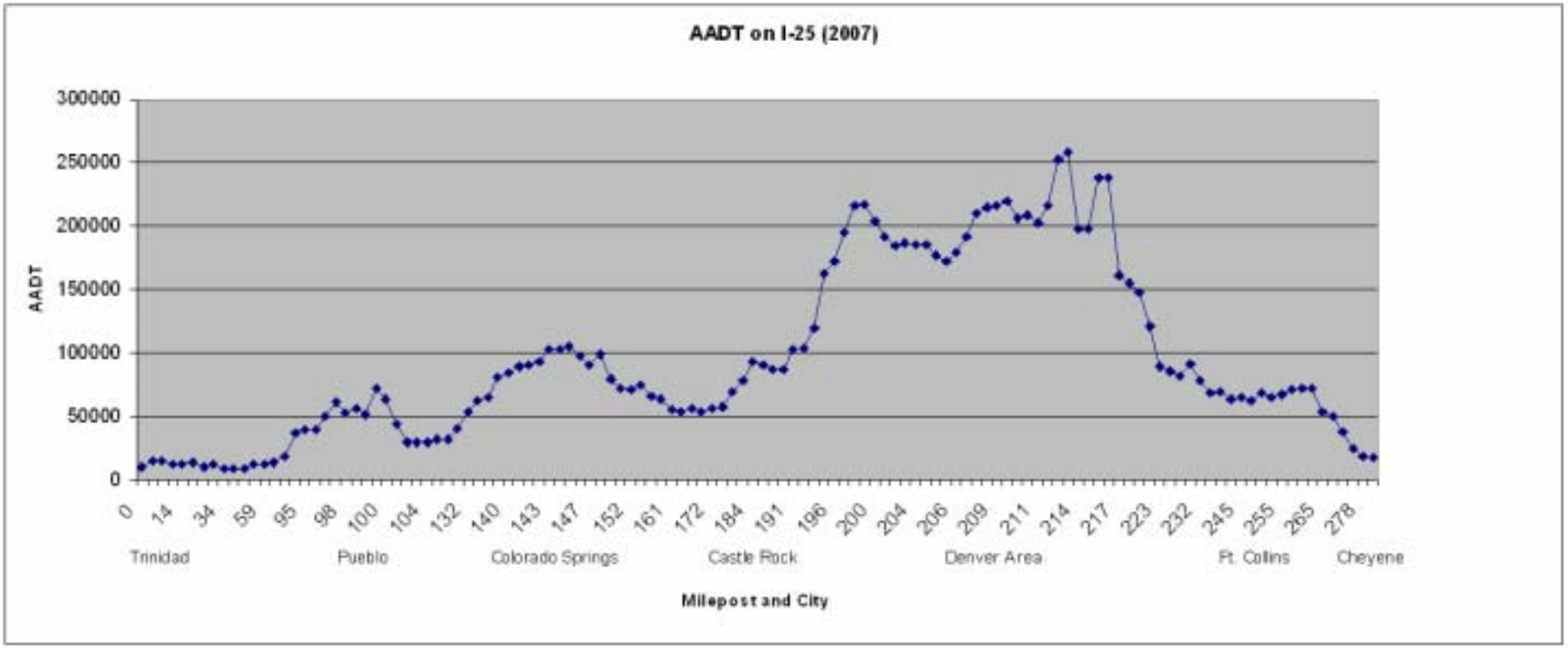
Source: TEMS, Inc. and Colorado Ski Country USA.

Statewide AADT Counts



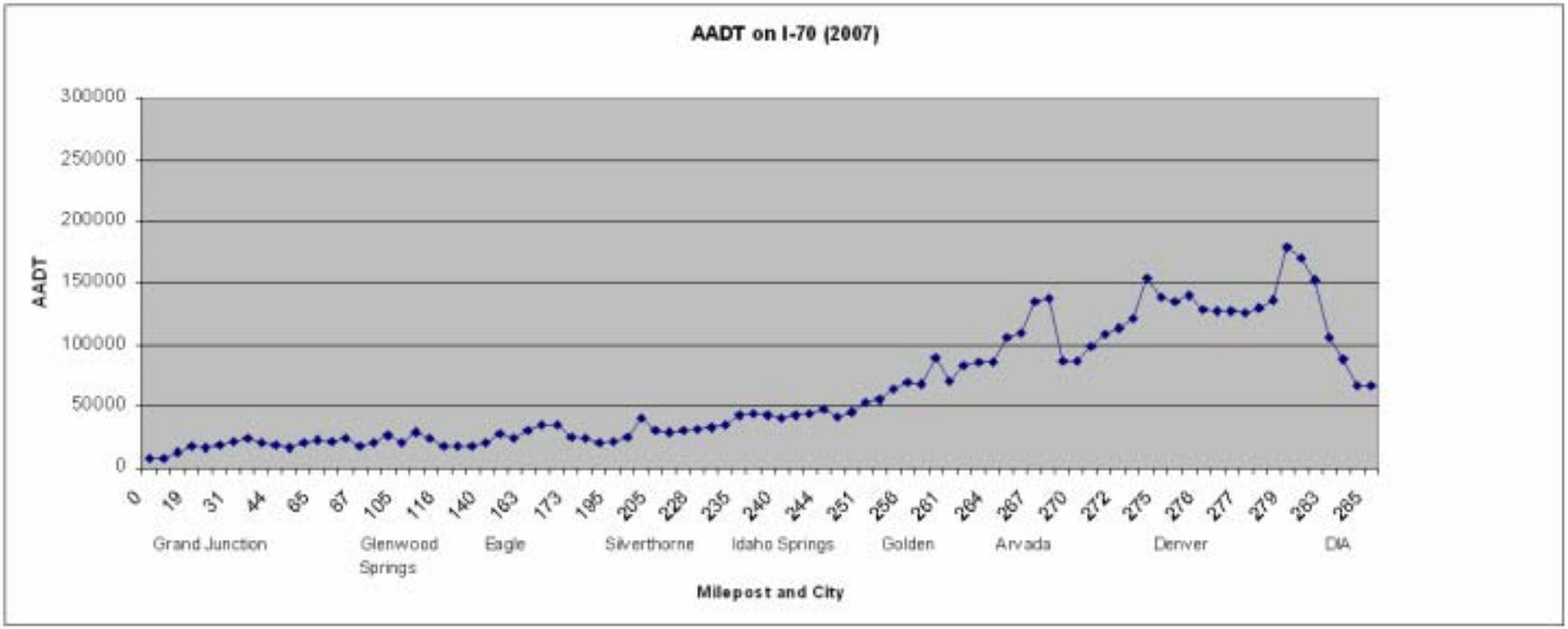
Source: CDOT, www.dot.state.co.us/App_DTS_DataAccess/index.ctm

AADT on I-25



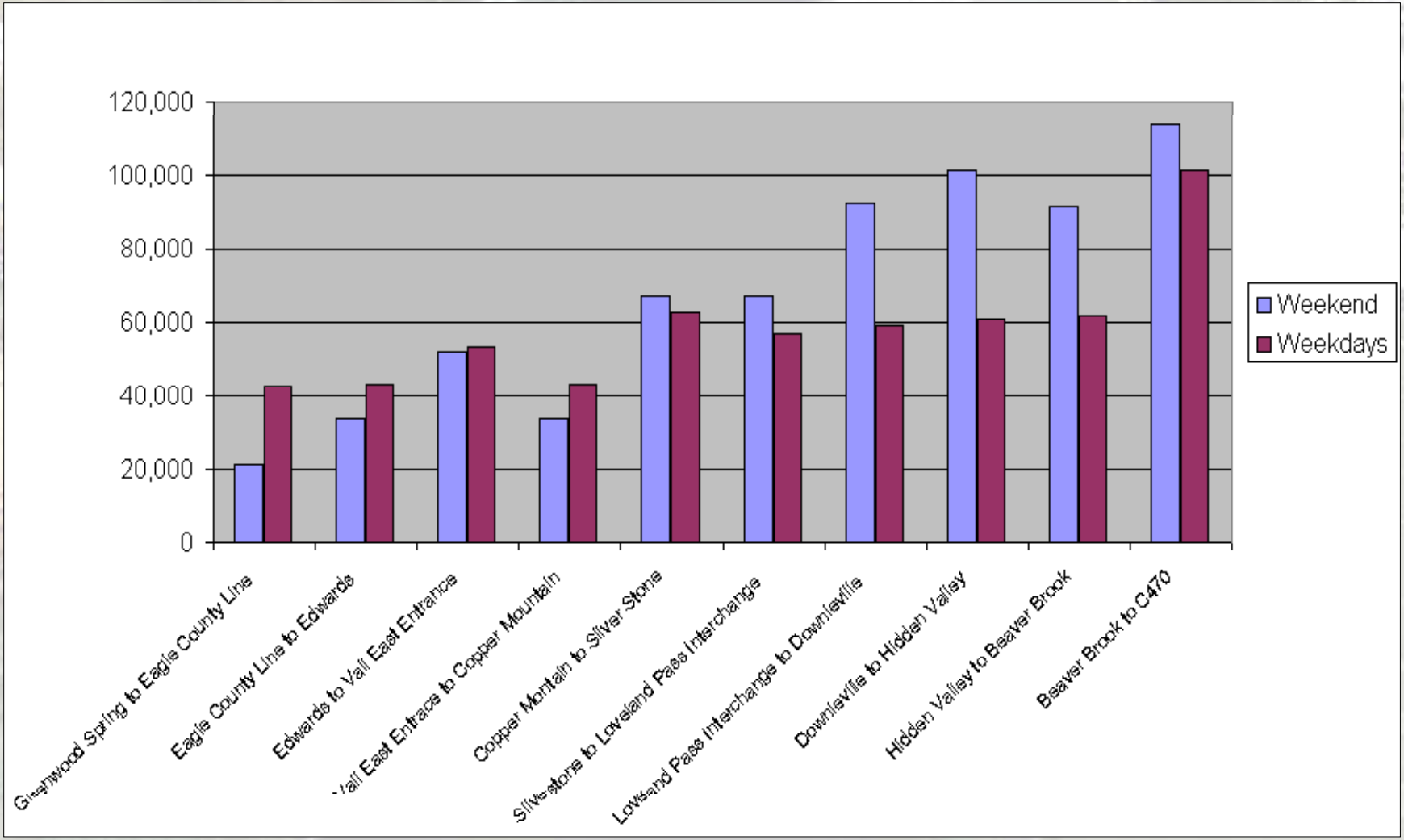
Source: CDOT, www.dot.state.co.us/App_DTS_DataAccess/index.ctm

AADT on I-70



Source: CDOT, www.dot.state.co.us/App_DTS_DataAccess/index.ctm

I-70 Corridor Weekday and Weekend Daily Vehicle Trips



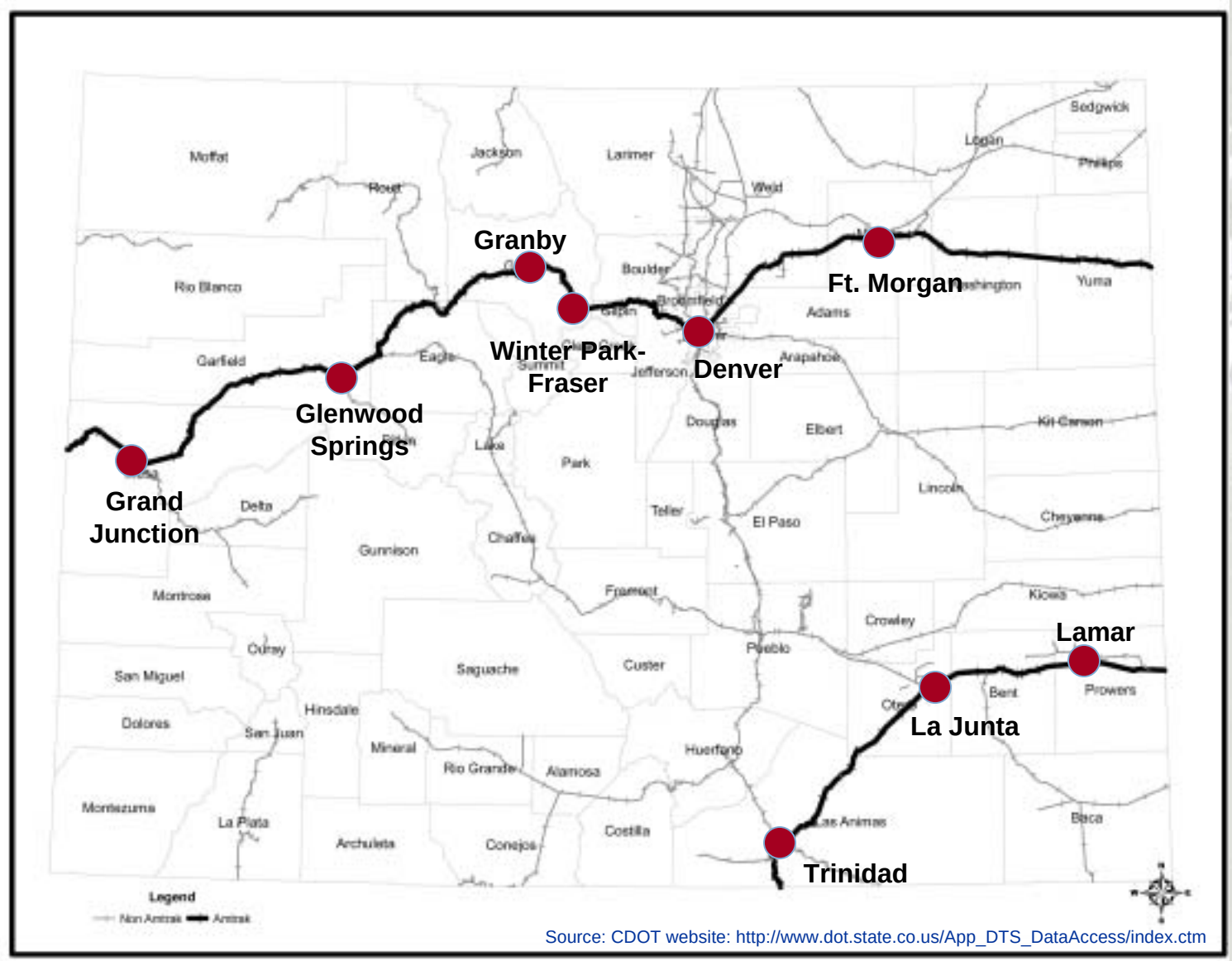
Source: I-70 PEIS

Annual Air Travel between Colorado and the Rest of the U.S.

Airport	To Rest of the U.S.	From Rest of the U.S.
Denver (DEN)	21,998,429	21,949,049
Steamboat Springs (HDN)	87,588	86,856
Ft. Collins/Loveland (FNL)	25,510	27,953
Eagle (EGE)	165,879	166,786
Grand Junction (GJT)	82,861	81,977
Aspen (ASE)	53,065	53,816
Colorado Springs (COS)	847,182	849,023
Montrose/Delta (MTJ)	43,778	44,017
Gunnison (GUC)	14,899	14,689
Pueblo (PUB)	1,301	1,302
Telluride (TEX)	4,237	4,026
Cortez (CEZ)	12	4
Durango (DRO)	34,655	34,667
Alamosa (ALS)	49	45

Source: Bureau of Transportation Statistics, www.bts.gov

Colorado Amtrak Passenger Rail Map



Source: CDOT website: http://www.dot.state.co.us/App_DTS_DataAccess/index.ctm

Amtrak FY2007 - Facts about Serving Colorado

City	Annual Boardings +Alightings
Denver	123,273
Fort Morgan	2,920
Glenwood Springs	32,697
Granby	3,508
Grand Junction	25,115
La Junta	6,556
Lamar	1,683
Trinidad	3,956
Winter Park-Fraser	8,844
Total Colorado Station Usage	**208,552**

Source: Amtrak, www.amtrak.com

Ski Train Route

Source: www.skitrain.com

Preliminary Assessment of Major Generation and Attraction Centers for Annual Intercity Trips*

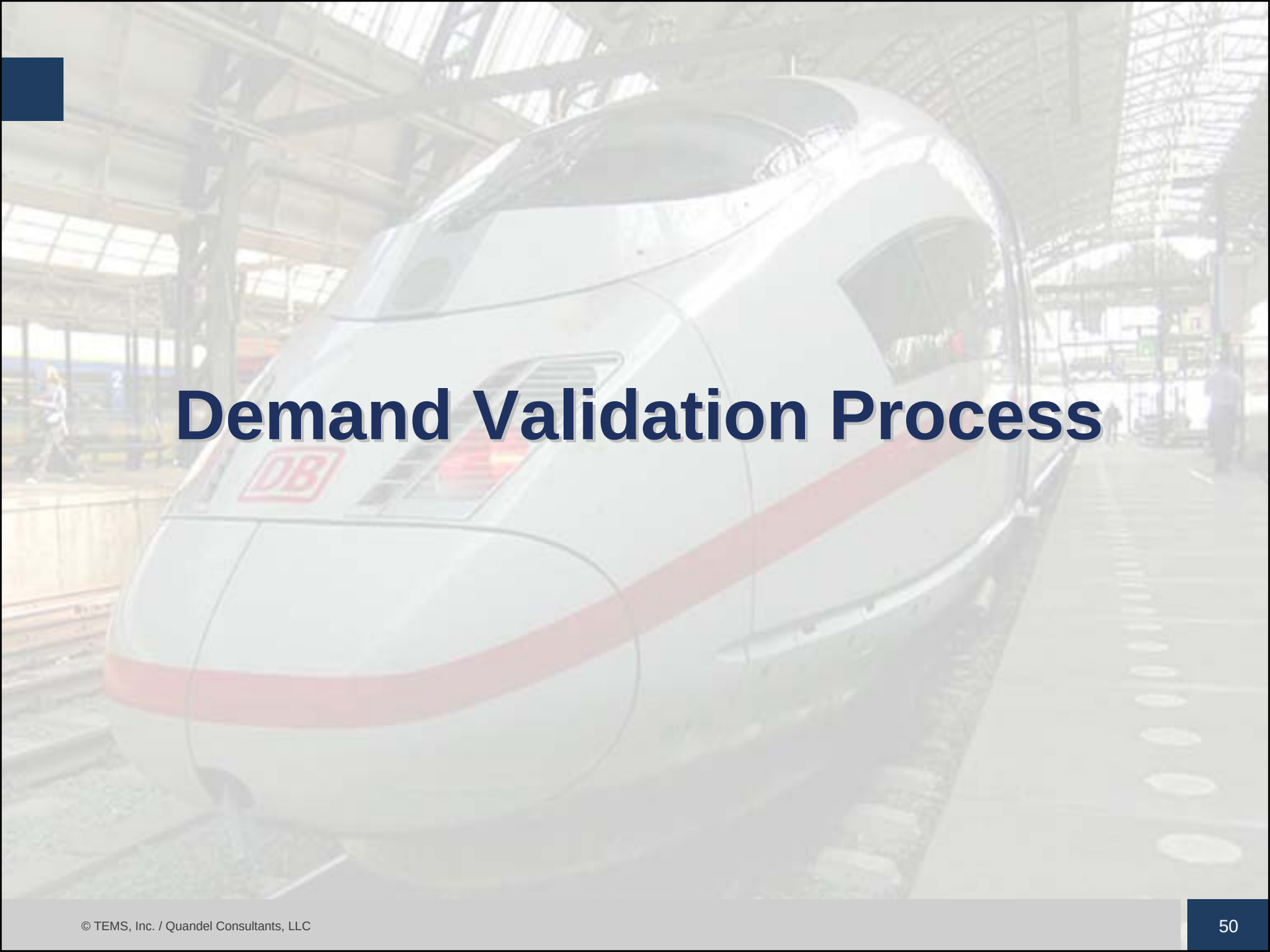
Key Locations for Intercity Trips	
Total Trips Colorado	99 million
Total Trips Colorado (overnight)	56 million trips
Total Trips Colorado (day)	43 million trips
Denver Airport (passengers & employees)	44 million trips
Denver	36.6 million trips
Colorado Springs	7.3 million trips
Fort Collins	3.6 million
Pueblo	1.8 million
Boulder	3.6 million
Blackhawk/Central City	12 million trips
Vail	7.9 million trips
Aspen	7.4 million trips
Breckenridge	8.2 million trips
Keystone	5.7 million trips
Copper Mountain	4.7 million trips
Steamboat Springs	5.1 million trips
Glenwood Springs	3.4 million trips
Avon	4.6 million trips
Grand Junction	4 million trips
Georgetown	1.5 million trips

*TEMS Analysis based on the data from Longwoods International, AADT flows, Denver Airport Master Plan, and Colorado Ski Country USA.

Trips and Population Equivalence of Key Locations in Colorado

Regions	Places of Attraction	Trips (in millions)	Population	Population Equivalence
DIA	DIA	44		2,669,040
	Total	*44*	0	*2,669,040*
Denver	Denver	36.6	2,411,836	2,411,836
	Total	*36.6*	*2,411,836*	*2,411,836*
South of Denver	Colorado Springs	7.3	602,496	602,496
	Pueblo	1.8	152,081	152,081
	Total	*9.1*	*754,577*	*754,577*
North of Denver	Boulder-Longmont	3.6	288,125	288,125
	Fort Collins-Loveland	3.6	281,620	281,620
	Total	*7.2*	*569,745*	*569,745*
Rockies	Blackhawk/Central City	12	633	809,829
	Vail	7.9	4,531	541,353
	Aspen	7.4	5,914	508,612
	Breckenridge	8.2	2,408	560,997
	Keystone	5.7	825	397,292
	Copper Mountain	4.7	289	331,810
	Steamboat	5.1	9,815	358,003
	Glenwood Springs	3.4	7,736	246,684
	Avon	4.6	5,561	325,262
	Grand Junction	4	134,061	285,973
	Georgetown	1.5	1,088	122,268
	Total	*64.5*	*172,861*	*4,488,084*
	Grand Total	**161.4**	**3,909,019**	**10,893,282**

Source:TEMS, Inc.



Demand Validation Process

Demand Model Validation

- Statistical Tests of Model.
- Total Demand – Compare with historic trends by mode.
- Elasticity Analysis – Comparison with known elasticities (e.g., other corridors that have been developed or are in development).
- Benchmark Analysis – Comparison with total demand, induced demand, and modal split for other corridors. (e.g., Boston-Portland, Northeast Corridor).

Thank You.